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**The economics of network forms and evaluation of clinical networks in the delivery of UK health care.**

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## **Introduction.**

Throughout most of the history of the UK National Health Service, since its inception in 1948, the delivery of health care has been managed through a series of 'hierarchical' (and monopolistic) forms of organisational control. Anxious to make the service efficient through the application of some measure of 'market' discipline into the provision of health care, reforms in 1991 ushered in a separation between purchasers and providers – a separation that survived the change of government in 1997. After the demise of the internal market in 1997 and a new emphasis upon co-operation, it perhaps seems inevitable, and attractive, that one solution to the difficulties of co-ordinating the efficient delivery of health care should be sought in an intermediate organisational form such as the *network*.

The term 'clinical network' originates in the idea of a management network, defined as a set of autonomous organisations that come together to reach goals that single institutions can pursue separately. Empirical research on inter-firm and inter-organisational networks has demonstrated the value of this type of economic co-ordination as a distinct form of governance structure when specific sets of structural and environmental conditions obtain.

This paper begins by reviewing the theoretical advantages and disadvantages of the network for the organisation of productive activities. Networks are seen as especially useful for the production and exchange of commodities whose value is difficult to measure, where access to resources based on knowledge and competencies are important drivers of success. (Thompson et al. 1991) But in order to act as engines for innovation and improved performance, careful attention must be paid to the economic circumstances within which networks are most appropriate. (Tomas & Arias 1995)

The importance of this theoretical review is that it should enable us to identify what circumstances are most appropriate to the network form of governance and what attributes are most important when examining the value of organisational networks for the delivery of clinical services.

Part two briefly examines the meaning and recent history of clinical networks within the UK National Health Service. There are significant organisational complexities around the development of these networks and implications for the existing institutional providers of health care. (South East Regional Office Working Group 2000) (Edwards & Fraser 2001)

Yet despite the rapid growth in clinical networks, evaluation has so far has been limited and based upon a broad set of agreed principles of good practice. (NHS Management Executive 1999) (Hamilton et al. 2002) What is absent from the literature is the description of a more formal conceptual framework that emphasises the distinctive economic characteristics of the network organisational form and their relevance to clinical networks in health care.

Part three then examines how the theoretical advantages and disadvantages of the network organisational form may be applicable to a clinical context. Despite some essential differences between private and public sector organisations, it is suggested that the same conceptual framework can be used to indicate the appropriateness of the network *form* for specific clinical services. The section concludes by considering how to measure the 'success' of clinical networks in the delivery of health care.

## **1. The Network as a Distinct Organisational Form.**

What factors determine the most efficient structural arrangement of organisational forms for the co-ordination of productive activities? Within traditional neoclassical economic theory the co-ordination of economic activities occurs through markets, firms and governments in a costless manner. Firms simply exist as independent, autonomous organisations operating within the competitive disciplines of the market. This is the well-known model of the firm as a ‘black box’ into which resources (including goals, knowledge and skills) go as inputs and out come the firm’s goods and services. Although production takes place within firms, the *processes* within these entities are not specified.

### **Markets, Hierarchies and Networks.**

One of the earliest formal critiques of this accepted wisdom was provided by Ronald Coase in his seminal paper ‘The Nature of the Firm’. (Coase 1937) In this Coase set out to answer a fundamental question: if the pricing system provides all of the co-ordination necessary for economic activity, then why do firms exist? Clearly firms also provide a major co-ordinating role within the economic system. For Coase the solution to this conundrum lies in the recognition that economic activities require both price-guided co-ordination and management-guided co-ordination. Yet price-guided co-ordination, even that which arises from the operation of a highly competitive market, is not costless as assumed within the neoclassical model. There are *transaction costs* associated with the acquisition of information about prices and the processes of negotiation and exchange. Transaction costs are costs related to the exchange of goods and services rather than their production. Some of these costs may be lower when undertaken within an organisation or firm. In the real world, therefore, a distinction can be made between ‘price-system costs’ and ‘management-system costs’. (Demsetz 1997) For Coase, the extent to which markets or firms co-ordinate economic activities depends upon the relative costs of co-ordination; firms will organise activities internally when the associated transactions costs are lower than when the same activities are organised through markets.

Note that this theoretical exposition of the effects of transaction costs is still firmly grounded within the behavioural assumptions of the neoclassical tradition: economic agents (consumers or entrepreneurs) are still self-interested, rationally motivated utility or profit maximisers. Hence firms will organise activities up to the point where the marginal costs of performing a particular activity internally are equivalent to the marginal costs of engaging in market transactions.

When firms organise activities internally this is done through the use of a command structure based on authority relations operating within a system of *hierarchy*. In contrast, the organisation of exchange activities between firms based on contracts operates within the *market*.

However, in recent decades, a different organisational form for the co-ordination of economic exchange has been conceived: the network. This has developed to an extent that *network governance* is now seen as a “distinct form of co-ordinating economic activity”, theoretically different from the ‘markets’ and ‘hierarchy’ models. (Powell 1991)

Many firms are no longer structured like medieval kingdoms, walled off and protected from hostile forces. Instead, we find companies involved in an intricate latticework of collaborative ventures with other firms, most of whom are ostensibly competitors. The dense ties that bind ... industries cannot be easily explained by saying that these firms are engaged in market transactions for some factors of production. (Powell 1991)

The concept of networks is now used as an analytical tool rather than just as a metaphor for organisational activities. (Park 1996) Within the last 25 years there has been a significant growth in the use made by firms of the network organisation. A basic feature of the network is that the resources available to the network are controlled ('owned') by a number of organisations ('firms'). Co-ordination of productive activities is obtained using informal social mechanisms rather than the operation of internal exchanges using bureaucratic control or through formal contractual relations negotiated within a market.

The literature on inter-organisational forms suggests three main factors affect the emergence and success of networks for the co-ordination of productive activities: transaction costs; economies of scale and scope; and, social relations.

### Transaction Costs.

Coase's fundamental insight – that firms exist as efficient institutional mechanisms for economising on transaction costs – subsequently formed the basis of a separate line of theoretical development, *transaction costs economics* (TCE), developed originally by Oliver E. Williamson. Within the TCE framework, exchange always occurs within the context of a particular form of *governance* structure. This is defined as "the institutional setting within which the execution of transactions is completed". (Williamson 1986)

For Williamson, efficient producers of goods and services want to minimise their total costs: costs that comprise both those associated with transactions (exchange) and those incurred through production. Williamson's distinctive contribution was to build on the insights provided by Coase in order to provide a more detailed theoretical exposition of why some transactions are undertaken within firms rather than through the use of markets. (Williamson 1985)

Transaction cost economics, as set out by Williamson, depends upon two sets of problems: the (behavioural) characteristics of decision-makers; and, the nature of transactions.

First within this framework, decision-makers are ascribed two main behavioural qualities. In the real world, economic actors are characterised as having 'bounded rationality'. This concept was also developed as a challenge to another unrealistic and rather heroic assumption within neoclassical market theory, that of perfect information in which all future and existing contingencies are known. (Simon 1957) Bounded rationality assumes that actors are still motivated by rational decision-rules<sup>1</sup> but the process is constrained by the absence of perfect information and by the cognitive difficulties of obtaining and assimilating all information of relevance to exchange. 'Opportunism' refers to the pursuit of self-interest "with guile". That is, people may behave in strategic, potentially devious, ways (perhaps concealing or misrepresenting their true motives, abilities or preferences) in order to gain advantages in trade. This may seem a rather dismal view of human nature. However, it is not necessary for all economic actors to engage in opportunistic behaviour, only that some may do so and thereby create information asymmetries.

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<sup>1</sup> This is *rationality* in the economic sense, which assumes that individual decision-making is regulated by an implicit calculation of the relative costs and benefits of different available courses of action in order to maximise 'utility' (or outcome).

Second, there are also three main variables that define the nature of transactions: asset specificity, uncertainty, and frequency.

‘Asset specificity’ refers to the extent to which a given resource has a value in a transaction that is higher than would obtain in other uses. Asset specificity may take a variety of forms: site or location specificity; physical asset specificity; human capital specificity; dedicated assets; and ‘brand name’ capital. As market exchange is based on contracts, the transaction costs of using the market are related to any costs incurred when these contractual arrangements are terminated. High asset specificity in the context of market exchange may leave the firm vulnerable to the threats of opportunism. Hence high asset specificity favours the internalisation of activities within firms through vertical integration.

‘Uncertainty’ rises as the number of alternative uses of available resources and courses of action within a given environment increases. Given bounded rationality, the ability to formulate detailed plans and guarantee favourable outcomes are limited according to the degree of uncertainty present. Duration is an important consideration here, as the longer the length of time over which transactions takes place the greater the levels of uncertainty. Higher uncertainty encourages the internalisation of activities within firms as a way of protecting against unforeseen adverse events and controlling for the effects of opportunistic behaviour.

‘Frequency’ refers to how often particular transactions occur. Firms would rarely want to vertically integrate so as to internalise the provision of a good or service that is rarely used. The greater the frequency of a transaction then the more likely it is that a relatively expensive governance structure can be justified to economise on transaction costs.

Transaction costs economics is still firmly wedded to many of the mainstream assumptions of economic theory: in the long run firms are still essentially profit maximisers, and profit maximisation depends on cost minimisation. Moreover, as the behavioural assumptions outlined above make clear, transaction cost economics also retains a formally ‘individualist’ approach to human motivation and interpretation of what directs relationships between economic actors.

Transaction cost economics explains why markets or hierarchies emerge as systems for co-ordinating economic activities and, therefore, in what circumstances organisations integrate vertically. But transaction cost variables can also be used to explain the emergence of network forms of governance.

Four main exchange conditions have been identified which favour inter-firm networks. (Jones, Hesterly, & Borgatti 1997)

- *Demand Uncertainty*. This refers to the difficulty an individual firm has in predicting and adapting quickly to changes in future requirements for its goods and services. Note, however, that this uncertainty is not restricted to wide and unpredictable variations in demand from its customers but also includes the effect of other factors that may impact on the firm’s ability to meet these demands (such as competition from other producers, regulation and legislative controls). In circumstances of high demand uncertainty, firms tend to control production using ‘flexible specialisation’ (reliance on agencies, outsourcing and sub-contracting). This condition increases the likelihood that firms will use markets or networks to organise production.

- *Asset specificity*. Hierarchies and networks are suited to exchange interactions where there is a high degree of asset specificity.
- *Frequent transactions*. Frequency refers to how often exchange occurs between firms and agents. As governance structures are relatively costly, infrequent transactions are best negotiated through the market, whilst frequent exchanges are more efficiently organised through hierarchies or networks.

In addition, frequent transactions allow “human asset specificity to develop from learning-by-doing ... and enhances the transfer of tacit knowledge among parties”. (Jones, Hesterly, & Borgatti 1997) This provides significant advantages for the network form when productive activity relies heavily on the transformation of resources using specialised skills and ‘know-how’.

Network governance structures are therefore especially useful for the production and internal exchange of commodities whose value is not easily measured (e.g. incorporate such intangible matters as know-how, technological capability, a particular style or approach to production, or have qualitative dimensions that are difficult to put a price on). (Powell 1991)

- *Task complexity*. Both hierarchies and network forms of governance are more appropriate to the production of goods and services that depend upon contributions from a number of different and highly specialised inputs. Complex products are manufactured using the co-ordinated activities of a range of skilled agents working collectively as a ‘team’.

Whether a network form of governance will emerge depends on the interaction of all these conditions:

“No single exchange condition propels the emergence of network governance; rather, a combination of specific conditions is required for network governance to emerge and to thrive as an organizational form offering comparative advantages over markets and hierarchies.” (Jones, Hesterly, & Borgatti 1997)

In addition, exchange interactions operating within conditions of high demand uncertainty, complex or customised tasks require high levels of human asset specificity and frequent transactions promote social networks amongst participants. The relevance of social relations in the formation of networks is examined in more detail below.

### Scale and Scope Economies.

*Economies of scale* are said to exist when marginal cost is falling as the scale of productive activity rises, so that average unit costs decline as capacity increases. Various internal and external sources of scale economies can be identified. Major internal (i.e., ‘within-firm’) sources include:

- *Technological economies*. These arise because of greater specialisation, capital and plant ‘indivisibilities’ and more efficient use of multi-stage production methods.
- *Organisational economies*. Larger organisations are often assumed to have the potential to centralise and rationalise certain activities as capacity increases; especially the ability to

economise on fixed ‘facility’ costs and on ‘overhead’ activities such as management, marketing and R&D.

- Reserve economies. Economies may also arise because larger organisations require proportionately less reserve capacity to cope with large and/or unanticipated variations in demand.

Significant internal scale economies favour the vertical integration of productive activities within firms. But networks also provide access to scale economies without the need for formal integration. These are based on opportunities for greater specialisation across participants, the ability to undertake larger or more complex projects than a single institution could handle and through co-operation to reduce the effects of demand uncertainty on individual partners.

*Economies of scope* mean that two or more outputs can be obtained more efficiently when produced together rather than when produced separately (i.e., there are benefits from the ‘joint production’ of two or more products). Two major sources of scope economies need to be considered in the present context: know-how and asset indivisibility.

‘Know-how’ is now seen as a significant cause of scope economies within an organisation.

A principal feature of the modern business enterprise is that it is an organizational entity possessing knowhow. To the extent that knowhow has general attributes, it represents a shared input which can find a variety of end product applications. Knowhow may also display some of the characteristics of a public good in that it can sometimes be used in many non-competing applications without its value in any one application being substantially impaired. Furthermore, the marginal cost of employing knowhow in a different endeavour is likely to be much less than its average cost of production and dissemination (transfer). Accordingly, although knowhow is not a pure public good, the transfer of proprietary information to alternative activities is likely to generate scope economies if organizational modes can be discovered to conduct the transfer at low cost. (Teece 1980)

Know-how is identified as one of the main assets of the modern organisation; and, in conjunction with innovation, is recognised as one of the most important engines for economic growth and competitive advantage. (Teece 2000)

Two types of ‘asset indivisibility’ are relevant to scope economies. (Teece 1980) First, there is the use of physical assets where larger units, when used to capacity, realise lower average costs. Where an indivisible physical asset serves as a common input into different production processes then joint production will produce economies of scope. Second, asset indivisibility may arise from the acquisition of information (know-how) because obtaining information may involve a set-up cost which makes it independent of the production process in which it is used.

Teece (1980) uses these concepts of ‘know-how’ and ‘asset indivisibility’ within a transaction cost framework to explain why firms diversify. Whether these factors which produce scope economies lead to diversification depends upon the extent to which they can be easily traded within markets. When such trading is difficult and costly, then diversification is more efficient.

Networks produce scope economies through access to the benefits of know-how contributed by different groups and disciplines participating within a network and through a reduction in the

costs of information acquisition. Networks, therefore, can provide an alternative governance form which avoids the high costs of obtaining know-how and information through trade (markets) whilst mitigating the bureaucratic costs of trying to provide all knowledge-based inputs, assuming they can be readily identified, internally within the firm (hierarchy).

## Social Networks.

Persistence of the fundamentally individualist explanations of human behaviour within mainstream economic models of co-ordination have been heavily criticised. The most relevant contributions in this context are those provided by sociologists working within the field of organisation and social-network theory. Conventional neoclassical and transaction cost frameworks are censured as inadequate for explaining economic institutions because they ignore the social contexts within which actors are *embedded*. In other words, we cannot explain aggregate patterns of behaviour only in terms of the individual decisions of many economic agents; we need to consider individuals within their social contexts. Embeddedness refers to the notion that economic behaviour is influenced by (i.e. embedded in) the dominant norms, institutions and social practices which are themselves culturally determined. (Granovetter 1985) Granovetter's notion of embeddedness steers a middle course between the 'over-socialized' conceptions of man, which emerged within mainstream sociological thinking, and the 'under-socialized' conception that dominates classical and neoclassical economics.

Actors do not behave or decide as atoms outside a social context, nor do they adhere slavishly to a script written for them by the particular intersection of social categories that they happen to occupy. Their attempts at purposive action are instead embedded in concrete, ongoing systems of social relations. (Granovetter1985)

Granovetter uses the 'markets and hierarchies' conception of economic co-ordination, initiated by the theory of transaction costs, to show how embeddedness generates a different set of understandings and predictions from that of mainstream economics. Reviewing a range of available empirical evidence, Granovetter concludes:

- even with complex transactions a high level of order can often be found in the 'market' (i.e., across firm boundaries), and a correspondingly high level of disorder within 'firms';
- social relations between firms are often more important than authority relations within firms for co-ordinating economic activities; and as a related point,
- transaction cost economics overplays the efficacy of hierarchical power within organisations.

Uzzi (1996) subsequently undertook an important empirical study using these concepts. This author combined the notion of 'embeddedness' with social network theory to argue that "the structure and quality of social ties among firms shape economic action by creating unique opportunities and access to those opportunities". (Uzzi 1996)

Uzzi (1996) used a combination of ethnographic analysis and statistical techniques to examine the hypothesis that the survival of a sample of (clothing) firms was related to the extent to which it used 'embedded ties'. Some of Uzzi's conclusions about the features of these embedded ties are worth summarising:



- Trust acted as the governance mechanism of embedded relationships. “Trust is important because it increases an organization’s access to resources and strengthens its ability to adapt to unforeseen problems that are difficult to achieve through arm’s-length ties.” (Uzzi 1996)
- “Information exchange in embedded ties is more proprietary and more tacit than information exchanged at arm’s length. It includes strategic and tacit know-how that boosts a firm’s transactional efficacy and responsiveness to the environment.” (Uzzi 1996)
- Embedded ties also entail joint problem-solving arrangements that provide more rapid and explicit feedback than market-based mechanisms and so accelerate problem correction and learning.

Uzzi (1996) found that these embedded ties developed mainly from third party referral networks and previous personal relations. An important result from the statistical analysis of firm survival was that those that transact within either low-embedded or high-embedded networks were more likely to fail. Moderately embedded networks were seen as more conducive to success because they create greater opportunities for new information and learning. (Uzzi 1996) (Uzzi 1997)

A further valuable contribution can be attributed to Gulati and Gargiolo (1999). Conceptually they distinguished between two sets of variables: exogenous and endogenous. The *exogenous* factors are those that encourage organisations to form networks as a response to challenges posed by the strategic interdependencies that shape their common environment. (Gulati & Gargiolo 1999) ‘Interdependence’ refers to resource dependencies between firms and opportunities available to reduce uncertainty through alliances. In uncertain environments, where competitive advantage is a function of asset like know-how and information, firms have a considerable amount to gain from collaborations that provide timely access to these inputs.

The *endogenous* variables comprised forms of ‘embeddedness’ and ‘structural differentiation’. Embeddedness can be examined according to three distinct forms: relational, structural and positional embeddedness. *Relational* embeddedness originates from an organisation’s previous direct alliances; *structural* embeddedness from its indirect alliances through ‘third parties’; and *positional* embeddedness results from the partner’s position in the network of pre-existing alliances. (Gulati & Gargiolo 1999) Structural embeddedness can be interpreted as the extent to which firms not only have relationships with each other but with the same ‘third parties’ as well. Positional embeddedness highlights the role central organisation play in the formation of networks. Organisations are ‘central’ because of the influence they have (this involves reputation as well as market power) and their access to knowledge and information of value to the network. The Gulati and Gargiolo study (1999) provides strong additional support for the importance of both relational and structural embeddedness in network formation.

In combining transaction cost and social network theories as an explanation for the emergence of networks, Jones, Hesterly and Borgatti (1997) concluded:

Structural embeddedness is critical to our understanding of how social mechanisms co-ordinate and safeguard exchanges in networks, for it diffuses values and norms that enhance co-ordination amongst autonomous units, ...its presence enhances the likelihood of network governance emerging and thriving in rapidly changing markets for complex, customized tasks.

Networks promote social interactions that generate trust (social capital), and emphasise 'behavioural interdependence' and 'reciprocity'; all of which are conducive to knowledge transfer and innovation.

*Structural differentiation* refers to the extent to which partners come to occupy an identifiable position within the network profile. Part of the economic gains which arise from a network do so from the complementary nature of the outputs, competencies and knowledge provided by participants. Research suggests that structural differentiation does have a strong positive effect on network formation. (Gulati & Gargiulo 1999) This study also suggested that central organisations tended to favour alliances with other central organisations (they perceive little advantage from co-operating with peripheral groups), whilst peripheral organisations do not tend to form alliances between themselves. (Gulati & Gargiulo 1999)

Sociological contributions to our understanding of organisations have clearly focused attention on the role that social networks play in the co-ordination of economic life; not only in terms of recognising the influence that informal social ties have within and between firms, but also that a *network* itself can be seen as an alternative to the conventional 'markets and hierarchies' paradigm.

This short review of theoretical and empirical explanations advanced for the emergence of network forms demonstrates the value of using a mixture of economic and sociological approaches to the study of organisations.

### **Mechanisms for Network Success.**

Having established the broad structural and social characteristics of exchange transactions that confer comparative advantage on the network form of organisation, what specific mechanisms facilitate the success of networks? The following have been identified as important. (Jones, Hesterly, & Borgatti 1997)

- *Joint payoffs.* Payoffs should be defined in terms of the final product (or outcomes) that require the contribution of *all* network participants. This provides incentives for all parties to pursue network objectives as efficiently as possible.

An important corollary of this is that there should also be *collective sanctions* against those who violate group norms or fail to meet agreed expectations in relation to either the volume or quality of the final product.

Networks are viewed as fundamentally based on co-operative relations. Co-operation means that the volume and quality of commodities produced depends on organising productive activities through agreements and partnerships rather than through formal price-based market transactions. Co-operation emerges out of recognition of mutual interests and objectives between separate organisations. But co-operation also implies reciprocity and dependency. Reciprocity emphasises aspects of mutual indebtedness and obligation.

Both joint payoffs and collective sanctions also raise important issues around the relevance and magnitude of principal-agent and incentive problems in the management of network forms of organisation. This will include the extent to which individual network participants have risk and effort aversion, the marginal contribution of each to the final 'product' or

outcomes and how easily this contribution can be separately identified. (Besanko, Dranove, & Shanley 1999) Networks then open up issues around identifying the most appropriate mix of incentives for *teams*; particularly given the potential negative externalities associated with large teams working across organisations. (Ratto et al. 2001)

However it is also important to remember that agency theory captures only a part of the complexity of economic life and can place a disproportionate emphasis on the role of incentives and self-interest in organisational thinking. (Perrow 1986) Although much of human behaviour can be attributed to self-serving factors, in the context of public sector networks we should not under-estimate the role that trust, altruism and notions of public service can play in the behaviour of professional groups.

- *Reputation*. This involves the subjective estimation of character, skills, reliability and other attributes of relevance to the completion of exchange transactions; particularly in the presence of uncertainty, bounded rationality and the potential for opportunism. Reputation enhances the success of network governance because it signals the likelihood that particular exchange transactions can be completed without resort to more expensive forms of governance (contracts within markets, bureaucratic controls within firms).

However, reputation does have some significant limitations: partly because it may be inaccurate or misunderstood, and partly because an over-reliance on reputation can inhibit the acquisition of new information.

- *Macroculture*. This refers to “a system of widely shared assumptions and values, comprising industry-specific, occupational and professional knowledge, that guide actions and create typical behaviour patterns among independent entities.” (Jones, Hesterly, & Borgatti 1997) The existence of common cultural ties between participants facilitates co-ordination as network members share the same (idiosyncratic) language and rules of professional conduct, have the same expectations and pursue common goals. Within professional groups, shared values and culture are often imbued through long periods of specialised training, sustained using strict codes of ethical conduct and through regular formal and informal contacts amongst members which reinforce expectations and professional norms.
- *Restricted access*. Restricted access refers to a strategic control on the number of exchange participants within a network. Restricting access reduces co-ordination costs and increases interaction frequency. By creating dependent relationships amongst those participating within the network, organisations become more reliant on each other. In addition, partners come to occupy distinctive roles within the network (i.e. *structural differentiation* exists). The costs of defaulting for an individual participant are higher than would be the case within a market relationship. This decreases the potential for opportunism.

### Potential Network Failures.

Given the structural conditions required to optimise the use of network forms, there is a tendency to think of networks as somehow naturally inclined to produce harmony and co-operation. But it would be wrong to characterise networks only in terms of collaboration and consensus; each exchange relationship within a network also provides a potential source of conflict as well as co-operation. Thus each point of contact may require formal *management* of the relationships so

that agents and activities do work in accordance with the overall objectives of the network. This will impose additional monitoring and co-ordination costs.

Williamson (1991) argued that, as a hybrid form of governance, networks are likely to be unstable in the long run because of significant co-ordination problems. As changes cannot be made unilaterally (market contracts) or by fiat (hierarchical control) but instead require consent, networks involve costly decision-making processes. The complexity of co-ordinating the activities of autonomous units for collective goals can lead to high bureaucratic costs. If individual goals and rivalry persist among network members then trust is undermined and 'free-riding' and opportunism will emerge. (Williamson 1991)

In addition to the co-ordination costs, a number of other specific disadvantages of network forms have been identified (Miles & Snow 1992):

- Over-specialisation. This practice can ultimately degrade technical expertise in peripheral agents and lead to a reduction in the overall flexibility of the network.
- Dominance. Over-reliance on the needs or activities of a particular organisation within the network can lead to the emergence of a dominant firm. This core 'firm' then sets quality standards and effectively begins to 'manage' the output and methods employed in other network participants. This possibility is often seen as one of the potential drawbacks to the 'hub-and-spoke' model for the organisation of production.
- Exclusivity. Networks can become closed systems; this can then "derail performance by sealing off firms in the network from new information or opportunities that exist outside the network." (Uzzi 1996)

## **2. Clinical Networks and the Delivery of UK Health Care.**

Networks of sorts have always existed in the provision of health care. Certainly alliances and partnerships have had a long if chequered history in the NHS, mainly in those areas where there has been a perceived need to integrated services across different agencies and institutions to provide 'seamless' care (e.g. mental health, care of the elderly). What is new is the idea that such networks, formally constituted with some regulation, can form an alternative means of managing the organisation and delivery of health care.

The 1995 Calman-Hine report on Cancer Services has been identified as the beginning of a direct steer in national policy towards clinical networks. (South East Regional Office Working Group 2000) This report recommended a new structure for service provision "based on a network of expertise in cancer care reaching from primary care through Cancer Units in district hospitals to Cancer Centres". (Calman & Hine 1995). Across England alone there are currently (November 2002) 34 cancer networks charged with redesigning services, cutting waiting times, and improving patient experiences and outcomes.

A further major impetus to the policy drive for clinical networks came from the promotion of the use of network structures within the Acute Services Review undertaken by the Scottish Office. (The Scottish Office 1998) The Acute Services Review group considered at least three types of network arrangement: hub-and-spoke models, 'loose' networks and 'managed' clinical networks.

The Scottish Office report describes the 'hub-and-spoke' concept as one in which the ties between the same specialty in different hospitals are more prominent than inter-specialty links on site. This type of model implies a hierarchy and is therefore suitable for highly specialised tertiary services. A perceived disadvantage of the hub-and-spoke model is the implication that the 'spoke' services are of lower status. Moreover, in its development to date this is not a model that has readily reflected the key role of primary care.

The Review was anxious to draw a clear distinction between 'loose' clinical networks and more formal 'managed' arrangements. Clinical networking cannot be seen as a "free-for-all": a loose "woolly" construct without authority and defined controls. The essential difference between 'loose' and 'managed' clinical networks should be the identification of a lead clinician who will help to define and reconcile issues of patient safety, confidentiality, risk management, individual accountability and professional responsibility.

The Review concluded that:

Such 'distributed' networks offer the best basis for equitable, rational and sustainable acute services, are flexible and capable of evolution, and allow greater emphasis to be placed on service performance and effectiveness. (The Scottish Office 1998)

Although one can understand perhaps why some of these qualities might be ascribed to such networks, given the conditions and characteristics of network governance structures set out above, it is not clear what 'evidence' was used to justify these expectations in the context of clinical services. The Review did examine the relationship between volume of clinical activity and outcomes of care. Quite extensive reference was made to the NHS Centre for Reviews and Dissemination systematic reviews of evidence on 'Concentration and Choice in the Provision of Hospital Services'. (NHS CRD 1996a) (NHS CRD 1996b). The NHS CRD reviews had pointed out that there was only limited robust evidence on a positive relationship between volume and outcomes, and that most of the available published studies suggested that economies of scale were exhausted at a relatively small hospital sizes (100-200 beds). The Acute Services Review therefore concluded:

... the critical mass needed to achieve the benefits which might flow from increased volume of activity can come through managed clinical networks rather than the centralisation or concentration of services.

Thus such organisations are seen as complementary to formal institutional merger or arrangements such as the 'hub-and-spoke' model that is essentially a different way of organising a network of services.

Subsequently, the Scottish Office defined Managed Clinical Networks (MCNs) more formally as:

... linked groups of health professionals and organisations from primary, secondary and tertiary care working in a co-ordinated manner, unconstrained by existing professional and organisational boundaries to ensure equitable provision of high quality effective services. (The Scottish Office 1999)

Quite properly, the Acute Services Review recommended that the use of Managed Clinical Networks should be piloted and suggested that they should be developed, in the first instance, for patients with atherothrombotic disease. As a consequence a pilot process to implement and evaluate a local network for coronary heart disease was set up in Dumfries and Galloway<sup>2</sup>. (Baker & Lorimer 2000)

However, despite the absence of any extensive evaluation of clinical networks they are now being rapidly implemented across a wide range of services within the NHS. Some are based on specific diseases (e.g. cancer, coronary heart disease and diabetes) or types of caseload (e.g. trauma, paediatric surgery); whilst others are organised according to more conventional speciality boundaries (e.g., vascular or critical care). Some networks are being set up to retain the broader client group focus (e.g. children, older people), and some are even based on functional lines (e.g. pathology).

More generally, networks are now being considered as an organisational solution to the complexities of delivering a wide range of health and public sector services. (Jackson & Stainsby 2000) (Pedlar 2001)

### **3. Evaluating the success of clinical networks in health care.**

#### **Network organisation and the provision of clinical services: main types of effect.**

Before considering the potential impact of networks on the delivery of health service and the main empirical research questions that we need to consider as part of their evaluation, it would be useful to briefly set out some of the main differences between ‘inter-firm’ and ‘clinical’ networks.

Perhaps the most significant difference is that inter-firm networks *emerge* as a strategic response to a particular set of commercial conditions. As indicated previously, evidence from research on inter-organisation networks in industry suggests that there are two important sets of conditions: the nature and interaction of the transaction costs incurred; and the strength of pre-existing ties amongst network partners.

Within the business world, groups who recognise a degree of inter-dependence and mutual self-interest come together to *form* networks. Networks are not *imposed* as solutions to perceived problems of co-ordination and scarcity of specialised resources. One important characteristic of network co-ordination therefore is the principle of ‘voluntarism’. However, formally constituted clinical networks over defined geographical, service or client-based areas will not emerge spontaneously out of a process of mutual orientation and preferential action. The need for comprehensiveness in the provision of a clinical service to users means that voluntarism must be sacrificed. In the first instance, many providers will not have a choice as to whether or not they can participate in a network<sup>1</sup>. In addition, the need to establish clear patient pathways, specialisation of service provision and sustainable capacity also means that this principle must be sacrificed *within* clinical networks as certain relationships become mandated.

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<sup>2</sup> The Dumfries and Galloway CHD network has a website (<http://www.show.scot.nhs.uk/mcn/>) which provides information on the structure of the network and the services provided, details of agreed protocols and reports on progress.

Hence there is a need to consider the extent to which network providers feel that they are willing participants within these arrangements and that clinical networks respect their autonomy.

It is important to re-emphasise that network governance represents an alternative to management structures based in institutions. It will only work if those involved see their relationships with members of *different* Trusts, professional groups and geographical areas as at least as important as their institutional allegiances.

This absence of voluntarism within clinical networks could increase the likelihood that conflicts among parties will occur. Given the conditions that favour network governance, the exercise of 'voice' is often seen as the most efficient means of resolving conflict; nevertheless 'exit' remains as an available option for participating firms. In many clinical networks now being set up, however, 'exit' strategies are not available and this means far greater time and effort must be devoted to the development of mechanisms that facilitate the expression of 'voice' and reinforce aspects of 'loyalty'. (Hirschman 1970) In addition to the costs that this will impose, it will also place a premium on the quality of leadership within clinical networks and the respect and trust that network management engenders within participants.

In broad terms, inter-firm network costs (i.e. 'governance structure' dependent) have been summarised as: (Belussi & Arcangeli 1998)

- Costs of network start-up
- Costs of participation in networks
- Costs of maintenance and refocusing when networks 'mature'.

Network related efficiency opportunities stem from the following factors: (Belussi & Arcangeli 1998)

- Economies of scale and scope.
- Use of tangible and intangible assets:
  - Tangible: Capital stock and technology (particularly in the presence of factor indivisibilities)  
More efficient use of relatively scarce specialised professional skills (higher activity for a fixed level of input)
  - Intangible: Critical mass of specific competencies  
Sharing common knowledge and benefits of interactive learning  
Peer review and team-based performance assessment

All of these 'governance structure' costs and efficiency factors are relevant to the assessment of clinical networks within health care.

Formally constituted networks – such as those being developed within the health sector – will inevitably require resources if they are to be appropriately regulated and managed. Given that the number of relationships that need to be managed is related to the number of 'nodes', some of these management costs will tend to be directly proportional to the size and complexity of a network. Moreover, participation in networks will not be costless. There will be a number of overhead and infrastructure costs associated with the set-up and maintenance of a network. Infrastructure support includes resources such as audit, information technology, personnel, finance and accountancy support. Whilst a network itself may be "light on overheads and

infrastructure” (Pedlar 2001), if there is no compensating re-organisation of supply from within existing secondary and primary care institutions around which the network is formed, then the overall volume of resources devoted to overheads and infrastructure will increase.

For the mechanism of ‘joint payoffs’ (and collective sanctions) to be applied in clinical networks then some form of network-based information sharing, performance assessment and peer review processes will need to be implemented. There exists a real disjunction at present between the current top-down approach to performance assessment and the growth in networks. (Smith 2002) Bottom-up approaches to performance assessment are possible and may be most appropriate for clinical networks: consider, for example, the Trauma Audit & Research Network or the Intensive Care National Audit and Research Centre. (Rowan & Black 2000) But this will involve additional investment in information technology - either to provide dedicated databases or to re-configure existing IT systems to supply the necessary data.

Perhaps some of the most interesting but problematic issues for evaluating the success of clinical networks are the existence of cost efficiencies, particularly those related to economies of scale and scope. Scotland’s Acute Services Review was quite explicit about one of the perceived advantages of clinical networks in this respect:

... managed clinical networks are based on appropriately trained and skilled individuals working in partnership in a hierarchy of appropriately established and managed facilities. Thus the benefits of any economy of scale can be achieved without having to incur the penalties of diseconomy of scale. (The Scottish Office 1998)

Scale economies often arise from greater specialisation and more efficient use of fixed capital and overheads as capacity is increased; the so-called ‘plant’ economies of scale.

One of the main drivers for concentration of hospital services is the perception that the merger of two smaller facilities must be more efficient because of the opportunities to reduce the cost of management and administration and eliminate unnecessary ‘duplication’ of services. But as indicated previously, managed clinical networks will require specific and dedicated inputs for management and administration. Unless this leads to a more than proportionate substitution of management and administration costs within existing provider institutions, this will not in itself produce efficiency savings. There is no evidence to date for substitution between network and provider management costs. The demands of performance assessment and the need for additional investment in information technology to support the measurement of quality and outcome indicators across networks – alongside existing institutional systems – are likely to lead to an increase in overhead costs.

Another major reason to predict economies of scale derive from the expected gains to be obtained from using highly specialised, but expensive, capital assets (e.g., diagnostic equipment). Many individual institutions may not have the resources to afford the capital investment or have the volume of workload that could use the equipment efficiently. By sharing access to such specialised resources over a network, it is posited that a more efficient use of capital can be achieved. For this to happen, volumes of workload across the network will need to be managed in ways that utilise these capital resources more effectively. This should be testable empirically. However, the gains from this source are not likely to be significant as this type of capital represents a relatively small proportion of total hospital costs. Note that this argument also presupposes that it is the specialised capital that represents the major constraint on managing current workload. In other words, that higher utilisation of this capital (wherever sited) will not



impact on the use of other inputs (doctors and nurses, for example). This is analogous to the fallacy that a reduction in length of stay can be automatically translated into the treatment of additional cases from the waiting list. (Jonsson & Lindgren 1980)

Scale and scope effects, however, should be considered both in terms of cost and quality. (Ferguson, Sheldon, & Posnett 1997) Quality and outcomes in health care are heavily dependent on the diffusion of new knowledge and skills. As indicated in the review of conditions that favour network forms, a major potential benefit attributable to the use of clinical networks would be access to know-how and information. Know-how and information affect the availability of scale economies. Inter-organisational networks exercise shared division of labour; this “division of labour allows network members to specialise in the value-creation activity supported by their own distinctive competence”. (Park 1996) Better use of specialist staff resources (especially knowledge and skills based) across the network can be achieved either by re-deploying staff or redirecting patients so that those staff with specialist skills can be used to optimum effect. A difficult balance may be required here, however, to avoid the drawbacks of over-specialisation and the emergence of a ‘dominant’ partner. The extent to which a network has led to a change in the use of specialised skills should be measurable using case-mix classified volumes of workload for network members.

Know-how and information are also important sources of scope economies; attributes that are especially relevant for organisations which depend upon the rapid diffusion of new knowledge and innovation for success. Networks are adept at transferring information about quality and know-how. (Uzzi 1997) It should be possible to assess the extent to which a clinical network has produced a better learning and skill-sharing environment. This can be achieved by looking at: rotation of staff; the extent to which network members are involved in learning and educational events; production of protocols; and, dissemination and implementation of good practice and new technologies of demonstrable benefit.

Better utilisation of capacity and specialised skills may also be obtained from clinical networks through active management of workload across provider institutions; some combination of both technological and reserve economies of scale. However most of this would be through an agreed re-configuration of specific elements of case-mix to take advantage of particular organisation-specific assets (physical and human). It is difficult to see how networks could manage overall volumes of caseload across participating institutions as a response to any wide and unpredictable statistical variations in demand. This may be even more difficult when Service Level Agreements with individual Trusts are increasingly defined according to specialty-based volumes (adjusted for case-mix) and costed according to a nationally agreed set of prices. (Department of Health 2002)

The absence of competitive pressures may reduce the focus on cost-efficiency. However, there may be a number of sound economic reasons to prefer an element of ‘redundancy’ within some organisations. The so-called ‘lean firm’ has often been seen as having a number of distinct competitive advantages within certain industries. But these have less relevance to an institution producing a highly diverse and sophisticated product-mix like health care. In these circumstances strategic objectives are more important to success than short-term efficiency gains based on a limited set of cost criteria. There are two main circumstances, in particular, when ‘leanness’ may produce inefficiencies for organisations: (Cusumano 1994)

- where there are rigidities in the face of sudden and unforeseen events;
- where success requires rapid development and dissemination of new knowledge and skills.

Both of these apply in the provision of health care and are relevant to the assessment of clinical networks' capacity to respond to changing circumstances. Clinical networks may provide the necessary 'redundancy' – that is, some time outside of their routine institutional commitments – within which to properly engage in knowledge and information transfer. This should be examined as part of the evaluation of networks.

Finally, given the qualitative improvements in working practices and environment expected from clinical networks, some costs may be lowered by significant reductions in staff absenteeism and turnover. This, too, can be determined empirically.

### **Network organisation and the provision of clinical services: main research questions.**

For a variety of reasons, some of which were touched on at the beginning of this section, the conditions which encourage the use of networks in private enterprise may not be appropriate to their use within public sector. Public sector agencies have a different set of goals. Profits, sales or market share measure the short- and long-run success of private firms; goals that are critically affected by efficiency in both transaction and production costs. However, health care delivery within a public system, such as the NHS, is strongly guided by an objective of equity as well as that of efficiency. Equity refers to notions of fairness in the distribution of the benefits of publicly funded health care; the overt pursuit of which may require significant efficiency trade-offs. Public sector agencies operate within an environment of political control.

The 'transaction cost' framework, therefore, may not provide a good model for explaining the *formation* of networks in the delivery of clinical services within the UK public sector. These are not created as rational (and voluntary) strategies for the minimisation of both transaction and production costs. There is some empirical support for this conclusion from a study that examined the interaction of asset-specificity and uncertainty on integration in a sample of private and public hospitals in the USA, which concluded that transaction cost variables provided little explanatory power for 'make or buy' decisions in public hospitals. (Coles & Hesterly 1998)

#### 1. Identifying the right conditions for a clinical network?

However, a combination of transaction cost variables and sociological insights on network formation could be used to determine whether conditions are appropriate for the use of the network form for organising the delivery of a particular set of health care services. Networks are not a homogeneous species. Despite the seductive language around the benefits of networks, they are likely to be inappropriate for some services; for example, those with low levels of uncertainty and asset specificity, and where transactions are infrequent. Despite the rapid growth in the use of clinical networks, their suitability for a specific service may crucially depend upon the interaction of those conditions identified as relevant to the emergence and success of a *network governance* structure generally.

This requires that we examine the extent to which each of the theoretical conditions that favour network governance obtain and interact and are functionally related to the *success* of a clinical network. The expectation is that networks are more likely to succeed where:

1. The interaction of the four main exchange conditions which favour network governance obtain (i.e., in relation to demand uncertainty; asset specificity; frequency of transactions and task complexity).
2. Networks are based on a moderate degree of social 'embeddedness' amongst members.

Where pre-existing ties do not occur, success will be related to the extent to which networks have facilitated embeddedness through social interactions between members.

3. Networks have built in structural differentiation. That is, the network should comprise a diverse (but complementary) range of skills, competencies and assets across partner groups. This diversity is important as a potential source of knowledge transfer.

The objective here is to try and develop a relatively straightforward taxonomy or framework that could be used to assess the appropriateness of the network form for a specific clinical service.

4. Measuring the success of a clinical network?

However, before we can test hypotheses around which conditions do favour the use of network forms in health care delivery we will need to define and measure what is meant by network 'success'. This question focuses on whether a given clinical network adds value to meeting the objectives of a publicly funded health care system, when compared to the traditional institutional (i.e. hospital-based) form. This is firmly grounded within the conventional evaluation framework of health economics. The issue can then be summarised in terms of a few quantifiable questions: the impact of a clinical network on the use of resources; the impact of a clinical network on patient outcomes; and whether there has been a significant effect on health inequalities? To this list we should also ask whether a clinical network has improved the processes and experience of patient care?

A number of useful reports have already considered some of the potential benefits and pitfalls around the use of networks in the delivery of health care in the UK. (South East Regional Office Working Group 2000) (Edwards & Fraser 2001) (Pedlar 2001) Edwards and Fraser (2001) tentatively suggest a series of factors that could be used as measures of network success (see Appendix 1). In addition, the Acute Services Group, a body established to facilitate the implementation of the recommendations of the Acute Services Review in Scotland, was anxious to ensure that the introduction of clinical networks was properly managed. One of this Group's first tasks was to develop guidance setting out the 'core principles' underlying Managed Clinical Networks and provide a procedure for their creation and dissolution. This was set out in a Scottish Health Executive's 'Management Executive Letter'. This guidance – reproduced as appendix 2 - also provides a useful set of criteria by which to evaluate the implementation of clinical networks. It has already been used for an interim evaluation of the Dumfries and Galloway CHD network. (Hamilton, Taylor, Wyke, Baker, Scott, & Sullivan 2002)

But whilst all of the factors set out within appendices 1 and 2 are highly desirable in themselves, and should form part of a evaluation, most do not directly address the fundamental economic evaluation questions posed above. Many of these features and practices may obtain within emerging clinical networks, but at what cost and for what benefit? Unless these effects translate into better outcomes for the resources consumed, then clinical networks will not represent a more efficient solution to the co-ordination of health care delivery.

Measurement is complicated by a number of possible confounders. Can changes be attributed to the operation of clinical networks *per se* rather than any number of other concomitant changes (additional resources; the impact of other ‘modernisation’ activities; etc.)? Duration will be an important variable in this respect. Redesign around clinical networks will impact first on structural and process factors and it may be some time before these are reflected in measurable improvements to patient outcomes. Research will need to identify a range of intermediate measures that can be accepted as robust proxies for outcomes.

### **An exploratory research project.**

The authors are commencing evaluation work with the West Yorkshire Critical Care Network. Networks have been formed to take responsibility for both the operational management of provision to the critically ill within a defined geographical area and for the strategic planning of Critical Care Services. Appendix 3 reproduces a Department of Health map that shows the boundaries of the Critical Care networks currently operating across England (November 2002). The West Yorkshire network includes all high dependency, intensive care and specialist critical care beds within the following Trust providers: Leeds, Bradford, Airedale, Pinderfields & Pontefract, Huddersfield, Dewsbury and Calderdale.

A range of both *qualitative* and *quantitative* methods is being used to explore issues of efficiency and the appropriateness of the network form for these services. The approach comprises:

- Documentary evidence and interviews to assess evidence on: clarity of objectives, roles, accountability, budgets and financial control mechanisms, etc. This will be used to evaluate the extent to which the network has established many of the good practice factors suggested within appendices 1 and 2.

Interviews will include a number of key stakeholders and facilitators who remain outwith the immediate network structure (at PCT and Trust level).

- Information on dedicated expenditures incurred for management of the network. This will include any incremental costs associated with IT, audit and ‘peer review’ processes specific to the network. The opportunity costs of network participation will be estimated from information on attendance and frequency of ‘network’ meetings, educational events, the costs of developing and disseminating protocols, etc.

Information will be sought on the extent to which management and support service costs are provided through a re-configuration of existing institutional resources.

- Statistical data derived from Health Information Systems operating within or across the local network providers (anonymised HES/PAS extracts) to assess how patient flows and demand have been managed across the network. The Critical Care specialty is also fortunate in having a national database for sites who contribute to the Intensive Care National Audit and Research Centre (ICNARC) which can be interrogated for information on risk-adjusted outcomes for different sites. Historical activity data will be used to assess how the network has affected utilization of critical care capacity across all participants. Data on ‘imports’ and ‘exports’ both

within network participants and with other Critical Care networks will also be examined, with particular emphasis on mapping changes to the volume of ‘non-clinical’ transfers<sup>3</sup>.

- Network forms are designed to promote co-operation, mutual dependence and reduce opportunistic behaviour. These and related factors (e.g., shared values, solidarity and trust) will be examined qualitatively along with the range and frequency of network ties.

This work is still in its early stages. There are important issues around how some of the transaction cost variables can be properly defined and quantified/classified within the context of clinical networks.

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<sup>3</sup> Each hospital has a unique group of neighbouring hospitals that form a ‘transfer group’. All transfers for non-clinical reasons outwith a transfer group are considered adverse incidents. However transfer groups may cross the boundaries of the defined networks.

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## APPENDIX 1.

### **Some possible success factors**<sup>\*</sup>

- clarity of objectives
- shared values
- a shared vision of how and where services are to develop
- a history of strong (and good) relationships between participants with high levels of trust, reciprocity and mutual understanding
- devolved responsibility and budgets
- primary care involvement
- clinical involvement
- avoiding bureaucracy on the one hand and over-complexity and fluidity on the other
- leadership style based on nurturing relationships
- standardised approaches to care, pathways and quality
- networks coincide with other social or work networks
- ensuring a reasonable balance of power between members
- finding an accommodation with the host organisations
- stakeholder support and sponsorship.

<sup>\*</sup> **Source:** Edwards and Fraser, 2001.

## APPENDIX 2.

### Core Principles for Managed Clinical Networks: NHS MEL (1999) 10.

- each Network must have clarity about Network management arrangements, including the appointment of a person who is recognised as having overall responsibility for the operation of the Network, whether a lead clinician, a clinical manager or otherwise. Each Network should produce a written annual report to the appropriate Health Board or Trust, which would also be available to the public;
- each Network must have a defined structure which sets out the points at which the service is to be delivered, and the connections between them;
- each Network must have a clear statement of the specific clinical and service improvements which patients could expect as a result of the establishment of the Network;
- each Network must use a documented evidence base, such as ... guidelines where these are available, and must be committed to expansion of the evidence base through appropriate R & D;
- each Network must be truly multi-disciplinary/multi-professional and should include representation from patients' organisations in its management arrangements;
- each Network must have a clear policy on the dissemination of information to patients, and the nature of that information, bearing in mind the role of primary care in helping to lead the patient through the system;
- all the health professionals who would make up the Network must indicate their willingness to practice in accordance with the evidence base and with the general principles governing Networks;
- an integral part of each Network must be a quality assurance programme ...;
- the educational and training potential for Networks should be used to the full, through exchanges between those working in the community and primary care and those working in hospitals/specialist centres;
- all health professionals in the Network must produce audit data to required standards and participate in open review of results;
- all Networks must include arrangements to circulate staff in ways which improve patient access, and enable professional skills to be maintained. Each Network should have an appropriate programme of continuous professional development in place for every member of the Network, as well as a mechanism for ensuring the programme is being followed;
- there must be evidence that the potential for Networks to generate better value for money has been explored.

In addition:

- the general principles of accountability and clinical governance will apply to Managed Clinical Networks as they do to all other work undertaken within the NHS.

### APPENDIX 3.

#### Networks for Critical Care services within England (November 2002).



Source: NHS Modernisation Agency (<http://www.modernnhs.nhs.uk/>)